

WOOD STRONGER than STEEL

Robert H. Moulton




THE weakness of wood is its grain—the fact that it is made up of a bundle of fibers. Each fiber by itself will stand a considerable pull, but each fiber in the bundle is held loosely to its neighbors on all sides. To make a wood that is capable of standing strain in all directions it is necessary to combine several layers cut at various angles to the grain.

Thus is made "plywood," said to be literally "stronger than steel." It is revolutionizing airplane construction, and it will enter conspicuously into post-war industry. It is even possible that as a wall covering the thinner varieties will compete with wallpaper. They possess all the beauty and durability of heavy wood paneling, for their composite nature prevents them from warping. Thin plywood has been found in toughness and flexibility to compare favorably with textile fabrics in the manufacture of airplane wings.

If anyone should say offhand that weight for weight, wood was stronger than steel he would be laughed at. However, the forest products laboratory of the department of agriculture, which is responsible for our knowledge of plywood and the various uses to which it may be put, has devised a testing machine which proves this very thing. Only, of course, the strength of the wood is estimated by the pull it will stand running with and not against the grain. For example, a toothpick of pine wood placed in this machine, with the idea of pulling it apart in the middle, will usually stand a pressure of from 75 to 100 pounds before it gives way. As against this, a 3-inch length of steel wire, of the same weight as the toothpick generally gives up when the tension reaches about 30 pounds. Various tests with this machine have shown that all of the denser woods can bear steel by from 300 to 600 per cent. When tested across the grain, however, the best of wood shows only from one-fourth to one-half of the strength of steel. That's why plywood was invented.

The panels used in the manufacture of plywood vary in thickness according to the article to be made of it. In the case of material for airplane wings, for example, they are only .01 inch of thickness. Gluing this veneer into a very thin panel of plywood has always been an extremely difficult matter for the manufacturer. The principal cause of trouble has been the excessive swelling and shrinking of the thin plies due to their absorption of water from the wet glue, which causes overlaps and a considerable amount of wrinkling. A second source of trouble is in the handling of the very thin material when it has been coated with a wet glue, since it is then very fragile and easily ruined.

To overcome these difficulties the forest products laboratory has evolved a process which consists of making a sheet of glue by coating thin sheets of tissue paper with blood glue, allowing it to dry, and using the coated paper as the glue layer for plywood. The process of making the panel then

consists merely in laying alternately as many sheets of thin veneer and sheets of this glue tissue as may be required to build up the panel desired. These sheets are then pressed in a steam-heated press. The result is an extremely thin panel in which the moisture content has been changed not more than 1 or 2 per cent. This simple method eliminates the troubles resulting from the use of a wet glue, and makes the handling of the thin material an easy matter.

The extremely thin plywood secured in this manner and tested on airplane wings built especially for the purpose proved surprisingly strong. It was found that it gave between 6 and 8 per cent added lifting power over the linen ordinarily used, by reason of the fact that the "flap" of the cloth is entirely eliminated. Weight for weight, its strength proved to be approximately the same, and it is quite likely that in the future all non-metal wings may be covered with this material.

When plywood was first thought of in connection with airplanes, an apparently insurmountable difficulty presented itself. A machine that had to be out in all kinds of weather and speed much of its time in a dense fog and in thick clouds must not be held together anywhere by glue that water would dissolve. To overcome this difficulty two new glues were evolved by the laboratory experts; one made from the blood of animals and one derived from casein—obtained from milk. Panels were glued together with these and tested in boiling water for eight hours. At the expiration of this time none of the pieces showed any separation of the plies. Soaking in cold water for ten days gave the same results. Finally, tests with a shearing machine, which applied force in such a manner as to push one ply from another, were made, and it was demonstrated that a pressure of from two hundred and fifty to seven hundred pounds to the square inch of glue surface was required to separate the layers, so strong were the new glues. As a matter of fact, it was, in most cases, not the glue, but the wood fibers themselves that gave way.

In considering the application of this new water-proof glue and plywood to industry in our reconstruction period, it becomes evident that an entirely new field has opened for progressive manufacturers of wood articles. Who, till now, has put on the market a standard door that will not warp? Plywood panels cannot warp after they are finished, for one ply holds the next rigidly. What manufacturer has got out a table or chair with glued joints that will not get shaky in a damp atmosphere? Furniture made with casein glue will hold together far better.

For smaller wooden articles built-up wood has immediate application, not only in replacing solid material but in extending the utilization of small sizes and low grades. Some of the articles already manufactured of plywood at the forest products laboratory, with most excellent results in every case, are wagon tongues, wheel hubs, plow

beams, sled runners, gun stocks, baseball bats, bowling pins, shoe lasts, hay blocks, and ladder rails. Even built-up railroad ties and telephone poles are by no means beyond the realm of possibility.

One cannot fail to be impressed by the possibilities of plywood as a factor of utilization. Not only would it make possible the saving of a large percentage of present woods and mills waste, but it might revolutionize present milling and grading practices. Select and clear material, the value of which is now lost in underuses or discarded by low-grade classification, could be utilized and valued as are now the more valuable hardwoods. From the standpoint of satisfactory service, there seem to be no limits to the possible substitution of plywood for most forms of solid wood.

Too Many Like Bill Smith

Department of Commerce Secretary Alexander was talking about the alien question.

"The alien," he said, "who comes over here, learns the language and gets naturalized—with him we have no quarrel; but too many aliens only come over to make a small fortune and then go back home. Such aliens are like Bill Smith."

"Bill Smith dropped in on his cousin, the Vanderpelts, one day with his trunk. It soon developed that Bill had come for a pretty long stay. From one week his visit lengthened into two, two weeks became three, and it wasn't till five weeks had gone by that Bill at last announced his intention to depart."

"The Saturday evening before his departure" Bill, who was a notorious tightwad, astonished and pleased the Vanderpelts by coming home with an enormous bundle.

"Just a little something," he explained, "to help out tomorrow's Sunday dinner." And with a beaming smile he undid the bundle's wrapping. "It's my farewell Sunday dinner with you, you know. I thought we might celebrate a little."

"It was a gorgeous bundle. There was a large turkey and a magnificent ham. There were green peas from Florida and luscious California peaches. There were nuts and raisins and candy."

"Well," said the Vanderpelts, after Bill had gone to bed, "so Bill has looked up for once."

"All hands enjoyed the farewell Sunday dinner tremendously, and on Sunday evening Bill departed by the 8 o'clock express. The Vanderpelts warmly urged him to come again. He had loosened up, and they felt very friendly toward him in consequence."

"Then, the next morning, the grocer's account came in, and the family learned that the whole of Bill's farewell dinner had been charged to Pa Vanderpelt."

they have things their own way. The outcome will depend on who has the grit. When you see the tips straightening into a fixed line and the eyes taking on a new luster you want to be on your guard. The man with grit isn't advertising himself. He just waits until action is needed and then you involuntarily make way for him.

Growing Sugar Cane. Sugar cane requires an abundance of sunshine and water and a deep, fertile soil. In planting, the stalks are

laid lengthwise in furrows, and each joint sends up a shoot, which later produces suckers. When ready for harvesting, a field of sugar cane resembles a corn field, but the plants are somewhat larger and there are no tassels and no ears. The stalks at this time have grown about 12 months and have changed from green to reddish in color, while most of the lower leaves have fallen away. They are cut by hand with a long knife, stripped of their leaves and carried on carts or small cars to the sugar mill.

Trials of Authors

"Just write up this little story," say the neighbors, interested in this cause or that, to the author they happen to know. It all looks so easy to them. But—"why the hardest thing I do is write to order," says Mary Heaton Vorse. "A kind of terrible blankness comes over me when I am ordered to write. I shall never forget being asked to autograph the front of some volumes of 'The Pretence' I had given

to a bazaar. Nine or ten of us had contributed our own books, and a devoted public was supposed to pay highly for the inscriptions in the front. Three days and three nights I wracked my brain for something clever and memorable to put in the front of those volumes. I let my story writing go. I stared at the blank front pages where the autograph and the humorous and interesting sentiment was to be placed. And in the end, practically, what I wrote, was 'November 9, Mary Heaton Vorse.' More I could not."

Perfect for the College Girl



IT IS certain that one-piece dresses for street wear are to rival suits during the coming fall and winter, and they may achieve leadership in the beginning of the season. Quite as certainly every fall wardrobe will contain one or more of these neat, convenient and economical garments. They are of the same character as suits, made of the same materials and adorned with the same trimmings. This makes it easy for the thrifty to convert a last year's suit into a this year's dress. An ingenious seamstress enjoys this remodeling of gowns and will find a variety of styles, ranging from very plain dresses to those that show touches of bright color and the introduction of clever draperies, which she can follow in her work. It is refreshing to have these changes in everyday clothes and substitutes for suits. Combinations of two materials, as satin and wool in the same color, solve the problem of sufficient material in made-over dresses.

The frock shown here will hardly tax the abilities of the average seamstress. Its skirt is straight-hanging, with rows of silk braid encircling it at intervals of about five inches and ma-

chine stitched, on one edge, to place. It is joined to a plain bodice at the waistline and has a narrow panel set on at the left side over the ends of the bodice. Satin covered, round buttons, set on in pairs, make a telling finish for this panel and the skirt may be taken as a criterion as to length.

The bodice has several details that are interesting. It opens at the side and on the shoulder, closing with snap fasteners. The sleeves are a little longer than elbow length and depend upon braid for their adornment, having no cuffs. Braid redeems the lower part of the bodice from uninteresting plainness and a close-set row of small satin-covered buttons extends from the bodice to the throat. The collar is very new, being a wide ruche of accordion plaited material like the dress, banded by a tie of narrow ribbon having a single long loop at the back, but the circle may be of the same material as the dress and finished at the left side, where it fastens with satin-covered buttons. This is a little more practical than a sash end.

What Late Summer Discloses



ONE thing distinguishes this particular summer from others that have recently preceded it, and that thing is its late summer millinery. August discloses hats that have no hint of autumn in them, hats that belong to the heart of summertime and none that are out of tune with it. The foolish practice of introducing wintry looking velvet headwear in the dog days has been abandoned and let us hope it has passed to that barren of outgrown follies from which no insect fancy ever returns.

It seems unnecessary for designers to attempt to add to their laurels, for there has been so much to admire in this season's millinery. And they have not made any radical new departure, but have delighted in taking the materials at hand and emphasizing those features in the season's styles that show most vitality.

Two of the four hats pictured in the group above, proclaim the revival of ostrich plumes. One of them, at the top of the group, is of lace, with a long, slightly curled plume encircling it. The other is a narrow-brimmed straw shape with short uncured single feathers drooping over the crown; both are summery, cool-looking models.

At the right, an off-the-face shape of straw braid and narrow pleated-edged ribbon has a row of small bows made of the ribbon for its adornment. This is a hat that will be worn into the fall in a shape that we shall meet again in winter millinery.

The hat of black georgette at the left of the picture is typical of the styles in mourning millinery. Its narrow brim is faced with white georgette and smooth folds applied to it very neatly from large disks on the crown and brim. The long, square-meshed veil has tiny squares instead of dots woven in it and a border of georgette. There is nothing burdensome or oppressive looking in this handsome model in which the designer has achieved an unusually successful hat while exercising much reticence in the use of mourning materials.

Julia Bottomly

Favored at Palm Beach. The tangerine is a very much favored color in Palm Beach.

Three Piece Suit.

A three piece costume is always expensive if made of good material and smartly trimmed, whether made by the tailors or bought ready to wear, but it will usually prove that it is not an expensive suit or an extravagance before the end of the season, because it is just exactly what it seems to be a two-in-one affair. The owner may have the frock part of the costume as dressy and as dainty as she desires, with the practically all enveloping coat ready to transform the whole into a

costume for street wear, while the dress is suitable for afternoon or even for evening functions.

Fur-Trimmed Blouses. Some unique fur-trimmed blouses have been designed to go with the three-piece suit. Of this sort of costume, the blouse is not the least important, for the band of fur at the bottom of the blouse gives the appearance of being a band across the coat. A collar is also managed in the same way.

Back Lame and Achy?

Housework is too hard for a woman who is half sick, nervous and always tired. But it keeps piling up, and gives weak kidneys no time to recover. If your back is lame and achy and your kidneys irregular; if you have "blue spells," sick headaches, nervousness, dizziness and rheumatic pains, use Doan's Kidney Pills. They have done wonders for thousands of worn out women.

A Tennessee Case
Mrs. J. B. Gardner, Centerville, Tenn., says: "About three years ago I overworked while housecleaning. My kidneys got out of order and backache was the most troublesome symptom of my complaint. My back pained a good deal and broke my rest at night and mornings I got up with severe headaches. My kidneys acted irregularly, too. I used Doan's Kidney Pills and two boxes cured me."

Get Doan's at Any Store, 60c a Box
DOAN'S KIDNEY PILLS
FOSTER-MILBURN CO., BUFFALO, N. Y.

MOTHER!

"California Syrup of Figs"
Child's Best Laxative



Accept "California" Syrup of Figs only—look for the name California on the package, then you are sure your child is having the best and most harmless physic for the little stomach, liver and bowels. Children love its fruity taste. Full directions on each bottle. You must say "California."—Adv.

The Law of Averages.

"That friend of ours was only allowed half a vote in the convention." "Things average up," replied Senator Sorghum. "I know of several elections in the dim past when he thought nothing of casting six or eight votes all by himself."

Nervous Spells—Near Heart Failure Eatonic Stopped It

Mr. C. B. Loris, writing from his home at Lay, Md., says, "I had been taking medicine from four specialists, but believe me, friends, one box of Eatonic has done me more good than all the remedies I have ever tried. I was in awfully bad shape. About half an hour before meals, I got nervous, trembling and heart pressure so bad I could hardly walk or talk. One box of Eatonic stopped it."

Eatonic quickly produces these truly marvelous results, because it takes up the poisons and gases and carries them right out of the body. Of course, when the cause is removed, the sufferer gets well.

Everyone that wants better health is told to have just a little faith—enough to try one box of Eatonic from your own druggist. The cost is a trifle, which he will hand back to you if you are not pleased. Why should you suffer another day, when quick, sure relief, is waiting for you? Adv.

Fooled Him That Time.

"How did you come to put this poem on the back of a Liberty bond?" asked the editor. "I was tired of hearing you say my poetry wasn't worth the paper it was written on."—Boston Transcript.

99 OUT OF 100

Need Vacher-Balm at Times.

Nothing better for summer colds, hives or itching. Keep it handy. Agents wanted where we have none. E. W. Vacher, Inc., New Orleans, La.—Adv.

Object, Consolidation.

"There's a great deal of romance in some of these personal advertisements."

"Well?"

"A lone widower would like to meet the lady in mourning who cried all through a Charlie Chaplin picture."

Shave With Cuticura Soap

And double your razor efficiency as well as promote skin purity, skin comfort and skin health. No mug, no slimy soap, no germs, no waste, no irritation even when shaved twice daily. One soap for all uses—shaving, bathing and shampooing.—Adv.

The Picnic.

Klunker—"The good book says, 'Go to the ant, thou sluggard.'" Bocker—"But it doesn't say anything about taking food along."

Wright's Indian Vegetable Pills are simply a good old-fashioned medicine for regulating the stomach, the liver and bowels. Get a box and try them.—Adv.

A June bride can't understand where the divorce courts get their business from.

BLOOD WILL TELL

If YOUR blood tells a tale of depletion and run-down condition, MAKE it tell a tale of health and the joy of life; by the use of Dr. Thacher's Liver and Blood Syrup; which purifies and vitalizes the blood, regulates the liver, keeps the bowels open and tones up the whole system. Sold by your druggist.

Mrs. Jennie Parker, of Santee, N. C., says: "I was sick 13 years. Had numb spells, my feet and hands cold, pain in my left side; not able to do anything. I tried several doctors. One said I had heart trouble and was liable to drop dead any time. So I quit doctors and began taking 'DR. THACHER'S LIVER AND BLOOD SYRUP.' It has cured me—I am well now and able to do all of my work. My weight is now 145 pounds."

THACHER MEDICINE CO.
Chattanooga, Tenn., U. S. A.

DR. THACHER'S LIVER AND BLOOD SYRUP

WINTERSMITH'S CHILL TONIC

SOLD FOR 50 YEARS. For MALARIA, CHILLS and FEVER. ALSO A FINE SPECIAL STRENGTHENING TONIC. Sold by All Drug Stores.

ENGLAND'S DIAMOND CUTTERS.

About 200 years ago Englishmen were the finest diamond cutters in the world, and the trade was nearly all carried on in London. Through religious persecution the cutters migrated to Amsterdam, where they have since remained.

Nail 'Em Down.

On a first-class liner it is said about 8,000 pieces of glass and crockery are broken on each voyage.